The identification of medieval fevers according to Al-Isra'ili, Avenzoar and Bernard Gordon

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In this work, which derives from a study into the prevention of illness in medieval Spain, and which forms part of a larger work on medieval fevers in all their aspects, we concern ourselves with their causes, symptoms, prognostications and treatment. We are grateful for the support of the British Academy and The Wellcome Trust in funding this study.

Through this work we aim to establish a certain order in the fevers which figure in the medical texts of the Middle Ages which we have analysed. We have grouped them, following the example of Galen, according to their point of origin: spirits, humours and solid matter. Then, within each of these categories, we have classified them by the spirit or humour affected. The basic elements of each fever are described in order to differentiate them. We offer, finally, over one hundred names by which the different fevers can be known.

Introduction

Fever, for Averroes, who took it from Avicenna[1], " is a heat extending throughout the whole body which damages all the functions and sensations of the organs, and because it produces this action we are of the opinion that it is a matter of an extraneous heat which produces the same actions as inate heat." That means it is capable of maturing the humours and, for that reason, is capable of effecting a cure[2].

So, fever is understood in the medieval world as the presence of an unnatural heat which corrupts life, in contrast to natural or innate heat which conserves life. But, as we know, fever is not simply an increase of bodily heat, a symptom, but constitutes an important chapter in the special pathology.

Medieval fever, according to Ibn al Yazzar, who in turn was quoting Galen, said that it was the most dangerous illness, the messenger of death and the most frequent cause of the end of life[3].

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[1] AVICENA, *Canon*, lib. IV, fen 1, tract. 1, cap.1, Venecia, ap. Vinc. Valgrisium, 1564, tomus II, I.

[2] AVERROES, *El libro de las generalidades de la medicina [Kitab al-Kulliyyat filtibb]*, Trad. M.C. Vázquez de Benito y C. Alvares de Morales, Madrid, Editorial Trotta, 2003, p. 119.

[3] BOS, G., *Ibn al-Jazzar On Fevers. A critical edition of Zad al-musafir wa-qut al-hadir*, London, Kogan Paul International, 2000, p. 7.

However, in spite of their importance, medieval fevers are not, in our judgement, well known. One possible reason is that, although the Galenic tradition was upheld throughout medieval medicine, it appears, as I.M. Lonie indicated, that Galen was not sufficiently clear about the concept of fever[4].

Even the simple task of distinguishing the different types of fever is not straightforward; not least for two reasons. We can count, and describe in the majority of cases, more than fifty different types of fevers, without taking into account the changes from one to another, the mixture between them and the association with other morbid processes. And then, at the same time, there are some which appear with other names. More than one hundred names in total, although, as we shall see, many of the fevers are the same.

By means of this work, we try to create some order in the denomination of medieval fevers, categorising them where possible into different classes. We classify them first by the material affected, then study the producing mechanisms of each one and, in this way, 'coin' each concept. We have to say that the distinctions are not always particularly clear. Some pathogens are omitted altogether by some of the consulted authors, and in other cases the authors do not agree.

We regard our work as laying the foundations for a substantial study on fevers, to which we can all contribute. For our purpose, we have concentrated our efforts on the writings of the three medieval authors on fevers who appear to us to carry particular weight. Their work covers the 10th to the 14th centuries, without doubt the most fruitful period of science in the Middle Ages, and between them they represent three contrasting cultural approaches. One is an Egyptian Jew, writing in Arabic in the 9th and 10th centuries; another is an Islamic writer from 12th century Spain; and the third is a Christian, writing in Latin in the 14th century. Thus we are able to examine and compare the contribution made by each culture, as well as considering individual monographs.

We have used, in chronological order, the following texts: the *Tratado de las fiebres* by Ishaq b. Sulayman al-Isra'ili , composed in the first half of the 10th century[5]; the chapter on fevers from Avenzoar's *Kitab al-taysir*

[4] LONIE, I.M. Fever pathology in the sixteenth century: tradition and innovation. *Theories of fever from antiquity to the enlightenment*, Ed. W.F. Bynum and V. Nutton, London, Wellcome Institute, 1981. pp. 19-44, p. 21.

[5] To carry out the work we have produced a transcription into current Castillian of the medieval version offered by José Llamas. See ISHAQ ISRAELI. *Tratado de las Fiebres.* Edición de la versión castellana y estudio por P. José Llamas, OSA. Madrid, CSIC, Instituto Arias Montano,1945. Henceforth al-Isra' ili. We are aware that the Castillian version contains some imprecisions and omissions, but are confident that this has not had a detrimental effect on our work.

fi l-mudawat wa-l-tadbir, which dates from the first half of the 12th century[6]; and the chapters devoted to fevers in the *Lilium Medicinae* by Bernard of Gordon, from the first half of the 14th century[7]. The first is a large monograph, a manual of clinical theory and practice on fevers which is considered to be most important of the medieval period; the second and third contain full chapters on fevers.

Of the three authors, the one who demonstrates the greatest clarity in the exposition of all the concepts on fevers is Ishaq b. Sulayman al-Isra' ili. Bernardo de Gordon shares his clarity, but the number of fevers described by him is much less. Nevertheless he adds some concepts, as indicated by Garcia Ballester, which are not tackled by al-Isra' ili and which have proved extremely useful for us[8]. We also know that Bernard of Gordon held different opinions on fever from those in general use[9]. Finally, of the three authors quoted, Avenzoar is the one who occupies himself with the fewest number of fevers but he is acknowledged to be the greatest clinician of all the celebrated Andalusian doctors.

2. Medieval fevers

As we have indicated, before denominating and fixing the terminology of medieval fevers, for which we have taken their pathogen as a base, we have proceeded to order the distinct fevers according to the well known Galenic triple classification:[10]

Fevers which affect the spirits (pneumas)
Fevers which affect the liquid parts (humours)
Fevers which affect the solid parts (organs)

Fevers which affect the spirits

Al-Isra' ili, like Avenzoar and Gordon, accepts in large measure that the fevers nominated ephemeral or one-day fever are a product of the affect

[6] Translated expressly for this study from the Arab edition of Misay al-Juri, Damasco, Dar al-Fikr, 1983. Henceforth Avenzoar.
[7] BERNANDO DE GORDONIO, *Lilio de medicina*. Edición y estudio por Brian Dutton y M. Nieves Sánchez. Madrid, Arco Libros, 1993. Henceforth Gordon.
[8] GARCIA-BALLESTER, L. La recepción del *Colliget* de Averroes en Montpellier (c. 1285) y su influencia en las polémicas sobre la naturaleza de la fiebre, *Galen and Galenism*. Ed. J. Arrizabalaga; M. Cabré; L. Cifuentes; F. Salmón. Aldershot, Ashgate, 2002, 317-332, p. 327.
[9] ALONSO GUARDO, A. Los pronósticos médicos en la medicina medieval; el *Tractatus de crisi et de Diebus creticis* de Bernardo de Gordonio. Valladolid, Universidad de Valladolid, 2003, p.42.
[10] Claudii Galeni Opera Omnia, Editionem curavit C.G. Kühn, Hildesheim, Georg Olms Verlags, 1964-65. 20 vols., vol VIII, pp. 276-281. Henceforth K.

on the spirits, natural, vital or psychic[11]. They are benign diseases which disappear within four days, and for which, according to Gordon, it is not usual to consult a doctor for treatment[12], although, on occasion, if the patient is not treated adequately, they can derive into other more dangerous fevers, as happens in the case of hectic fever.

Fevers which affect the natural spirit

As we know, the natural spirit is the force responsible for the organism carrying out part of its nourishing function, especially the three digestions. It has its base in the liver.

Fever produced by an intense cold

For al-Isra' ili, this fever is the product of a great cold which surrounds the patient for a length of time as a result of snow, ice or great storms. Excessive exterior cold acts on the person causing the natural heat to withdraw into the depths of the body, where it concentrates, grows and takes possession of the blood. This hot blood arrives at the liver and affects the natural spirit which, as we know, belongs to this organ, and affects to a lesser degree the spirit which is found in the heart (vital spirit) or the brain (psychic spirit)[13]. Avenzoar refers briefly to this fever but describes neither its origin nor its means of production[14]. Gordon does not mention it at all.

Fever produced by bathing in harmful water

According to al-Isra' ili , if the patient bathes in rough water, water for washing linen or water which contains a lot of mud, sulphurs or gypsum, he will contract this type of ephemeral fever. The same will happen in stagnant water. The mechanism of the process consists of these waters causing the body to dry out and, in consequence, the pores of the skin to close up. Since the heat cannot get out, it concentrates in the internal parts of the body, takes over the blood and reaches the liver where it first affects the natural spirit, then passes to the vital, and later the psychic spirit[15].

[11] al-Isra ili, p. 23; Avenzoar, p. 390; Gordon, p. 65.
[12] Gordon, p. 64.
[13] al-Isra' ili , pp. 26 and 36.
[14] Avenzoar, p. 390.
[15] al-Isra' ili, pp. 26 and 40.

For Avenzoar, harmful water is that which has a cold nature, strongly astringent, in which there are vitriol, alumina, alumbre or similar things. It has the same dangerous characteristics as cold water. But he says (we think erroneously) that these substances open the pores of the skin excessively[16]. He does not elaborate how this produces the fever[17]. Gordon indicates as dangerous only those baths which are taken in sulphurous water or cold water. The producing mechanism of this fever is the same as that offered by al-Isra' ili but he does not explain to us which spirit is affected[18].

Fever produced by ingesting food, drink or medicines of a very hot nature

Al-Isra'ili indicates that this fever is produced by an internal cause, such as taking food or drink of an excessively hot nature, although he does not specify which. All food and drink goes first to the stomach and then to the liver, and if these are too hot they cause the blood to boil and, by continuation, produce the same effect in the natural spirit[19]. Avenzoar does not concern himself with this. Gordon, in addition to hot food and drink, adds medicines of the same nature as a potential danger – the consequence of a possible error by the doctor. Among the foods with these characteristics he quotes garlic[20], onions[21], pepper[22] and the *gurbion*[23]. As an example of a hot drink he indicates wine – strong, mature and pure – but he does not specify any medicines with these characteristics[24]. However, at another point in his book he records some ephemeral fevers caused by poison. We believe it is appropriate to include this cause

[16] Doubtless the result of an error by Avenzoar. It should read that the pores close, because this is the property of treatment by astringent water, as al-Isra' ili indicates.
[17] Avenzoar, pp. 390 and 393.
[18] Gordon, p. 56.
[19] al-Isra' ili, pp. 27 and 42.
[20] Garlic, according to Andrés Laguna, is hot and dry in the second degree. PEDAZIO DIOSCORIDES ANAZARBEO, *Acerca de la materia medicinal*...traducido del griego por el Dr. Andrés de Laguna, Salamanca, por Mathias Gast, 1566, [edición fácsimil, Barcelona, 1994], p. 232; According to Juan de Avignon, they are hot and dry in the third degree, which is more coherent with the exposition in the text. AVIÑON, J. *Sevillana Medicina*, Introducción, edición, versión y notas por J. Mondejar. Madrid, Arco Libros, S.L. 2000, p. 198.
[21] The grade of heat of the onion is not stated in PEDAZIO DIOSCORIDES, *op. cit.*, p. 231. However, Juan de Aviñon says they are hot in the third degree and dry in the second. Idem, p. 197.
[22] Andrés Laguna says that pepper heats and dries in an important manner. PEDAZIO DIOSCORIDES, *op. cit.*, p. 238.
[23] Appears to concern euphorbium gum. HERRERA, M. T. (Dir.) *Diccionario español de textos médicos antiguos*. 2 vols., Madrid, Arco Libros, S.L., 1966, p. 799. The euphorbium is hot and dry in the fourth grade. PEDAZIO DIOSCORIDES, *op. cit.* p. 327. Both Gordon and Juan de Aviñon say *gorbion*, Idem., p. 327.
[24] Gordon, p. 56.

here, since some vegetable and mineral poisons tend to have a very hot nature, included in the fourth grade of heat and dryness[25].

1.1.4 Fever which appears after excessive exercise

Abusive exercise is included by al-Isra' ili and Avenzoar among the external producing causes of illness. This fever occurs among people who walk or ride for many consecutive days. Al-Isra'ili indicates that the fever appears after an excess of physical work, and its producing mechanism is that which affects the three powers, especially the natural spirit since, by an excess of work, the organs become hot and dry. Later the muscles and the nerves too get hot. The heat generated rises to the brain, taking possession of it and confusing it[26]. Avenzoar says only that fever can be produced by a fatigue which goes beyond all limits[27]. Gordon derives this fever from excessive exercise and includes it in the same group as anger or sadness, but not among external causes. He does not reveal the producing mechanism of the fever[28].

Fevers which affect the vital spirit

The vital spirit exists in relation to the regulation of innate heat, a function which is carried out during respiration. Its origin is the heart. At the same time, the heart is the organ where, according to many authors, the feelings are established.

Fever produced by anger

As to the place where the fever originates, our authors do not agree. According to al-Isra' ili, anger figures among the external causes of illness, and Avenzoar is of the same opinion[29]. This fever results because the heat of the anger takes possession of the psychic and vital powers. By continuation, the blood boils, produces fever and goes out to the external parts of the body. Avenzoar does not agree, since he says that great anger produces an excessive heat in the heart, seat of the vital spirit, which subsequently burns, and produces in this way a fever[30]. For Gor-

[25] Gordon, p. 58. See for example cantharides or euphorbium, PEDAZIO DIOSCORIDES, *op. cit.*, p. 581 and 327.
[26] al-Isra' ili, pp. 26, 27 and 45.
[27] Avenzoar, p. 390.
[28] Gordon, p. 56.
[29] al-Isra' ili, p. 26.
[30] Avenzoar, p. 390.

don, this fever does not result from external causes. He maintains that anger is an excessive movement of the natural spirit, contradicting what we have just explained. He does not offer the producing mechanism of the fever[31]. In this instance, we believe that Avenzoar best reflects the feeling of the time. For that reason, we have included this fever in the part of the vital spirit, since we think with Avenzoar that anger affects principally the heart, traditional seat of the feelings and vital spirit.

1.2.2 Fever originated by a great sorrow

Only al-Isra'ili concerns himself with this. Sorrow distinguishes itself from sadness in that the former belongs to the spiritual power which rests in the heart, and the latter to that in the brain. Although the treatment is the same as that for sadness, this fever is different and the prognostication worse, for it can be transformed into hectic fever or consumption. We do not know its producing mechanism[32].

Fever produced by inflammation and swelling

For al-Isra' ili, the fever is produced by the presence of inflammation (abscesses) located in the throat, neck, armpits and below the ears. According to this author, the blood, passing through the foruncles where it meets bad blood, becomes hot and the heat passes to the heart where it engenders fever. We suppose that in the heart it would affect the vital spirit, although he does not say so[33]. Avenzoar omits any reference to it. Gordon only credits it when in relation to the lesser abscesses which appear in the armpits and the groin. Then, in another part of the work, putrid fevers are also mentioned, resulting from large abscesses (foruncles) which affect the main tubes. The producing mechanism would relate to the spirits which pass through those altered tubes and become inflamed, causing the fever to appear[34].

1.2.4. Fever produced by anxiety

Al-Isra' ili is of the opinion that anxiety produces a great dryness of the body which takes over the heart. In which case, it is important that the patient does not take dry food, so that he does not increase the dryness and develop hectic fever. This fever, of all the ephemeral fevers, is the one

[31] Gordon, p. 56.
[32] al-Isra'ili , p. 53.
[33] al-Isra' ili , pp. 27 and 47.
[34] Gordon, pp. 57, 64 and 67-68.

which most frequently passes to hectic, because of its great dryness[35]. We suppose that inside the heart it would affect the vital spirit, although he does not say so expressly. Neither Avenzoar nor Gordon mention this fever.

1.2.5. Fever produced by a syncope

This fever is included by al-Isra'ili among the putrid ones, that is to say those which are based on the humours, without saying which is the altered humour. Avenzoar does not mention it and Gordon, who only refers to it in passing, includes it among the ephemerals[36]. Al-Isra'ili maintains that this fever only appears when the patient consumes excessive amounts of food, so that the body cannot tolerate it and the heart fails, producing the collapse. Also, as a result of a reduction in the amount of blood which comes out of the heart for whatever reason[37].

Since, in this case, the heart is the producing organ of the fever and at the same time the seat of the vital spirit this allows us to follow Gordon and place it in this particular category.

Fevers which affect the vital spirit

The psychic spirit is found in the brain. It exists in relation to memory, thought and the general function of the senses.

Fever produced by a great sadness

Al-Isra' ili specifies that this illness is produced by a great effort of the soul, equal to that which results from anger, since sadness belongs to the spiritual power based in the brain. There are two types of sadness: one motivated by a longing for desired beings, and another whose origin is a great fear for the safety of a person or his possessions. He does not say how this fever is produced[38]. Avenzoar barely mentions it[39], and Gordon not even that.

[35] al-Isra' ili, p. 55.
[36] Gordon, p. 68.
[37] al-Isra' ili, p. 176.
[38] al-Isra' ili, pp. 26 and 53.
[39] Avenzoar, p. 390.

Fever produced by a great lack of sleep

Al-Isra' ili maintains that a fever which occurs as consequence of staying awake continually, affects the psychic spirit. To explain its mechanism of production he returns to the words of Hippocrates. Whenever a man stays awake for long periods and does not sleep, the organs of the body move, heat escapes and from the places where the digestion of the food should be produced. The food thus remains raw and produces vapours in the body. One author adds that this fever affects the psychic spirit in the brain, so that this is extenuated and debilitated[40]. Avenzoar includes wakefulness among the external causes capable of producing illness but, once again, does not indicate the mechanism of production[41]. Gordon does not mention this fever.

Fevers which affect one or another spirit

1.4.1. Fever produced by excessive heat

Al-Isra' ili maintains that the heat of the sun, especially during the summer, produces a great effervescence in the blood in a way which affects the brain, seat of the psychic spirit[42]. Also it can produce another unnamed ephemeral fever, owing to the fact that the air is very hot. Breathing this air heats the heart, an organ which already has a lot of heat, producing fever[43]. According to al-Isra'ili , it would affect, on some occasions, the psychic spirit and, on others, the vital.

Avenzoar does not reveal anything more to us, but says it is produced by excessive exposure to the sun, regardless of the season, although he does not indicate its pathogen[44]. Gordon does likewise, adding the heat of fire and the steam bath as causes, which are not included by the other two authors. However, he does not agree with al-Isra' ili on the form of production. For Gordon, blood has no role in the process. It is in the skin where the damage occurs, which brings with it the obstruction of the cutaneous pores. He maintains that in the organs of a hot and dry constitution, this obstruction prevents the expulsion through the skin of the hot and dry gases of the body, causing it to heat up excessively and give the appearance of fever[45]. He does not clarify which spirits are affected.

[40] al-Isra' ili, pp. 49-50.
[41] Avenzoar, p. 390.
[42] al-Isra' ili, p.26.
[43] al-Isra' ili, pp. 33-34.
[44] Avenzoar, p. 390.
[45] Gordon, p. 56.

To our mind, Gordon's explanation, that heat blocks the pores of the skin, does not appear correct, given that a hot bath is used in ancient and medieval medicine for the opposite purpose, to open the pores. We advocate then, the explanation given by al-Isra' ili.

Fevers which have their origin in a non specific spirit

1.5.1. Fever as consequence of prolonged fasting

Al-Isra' ili alone speaks of a fever resulting from a great fasting. He does not offer its pathogen, although he does refer to its symptoms and treatment, which are not of relevance here[46]. Avenzoar ignores it and Gordon only admits its existence when he speaks of giving those with fever a quantity of moderate food[47].

1.5.2 Fever produced by Nausea

This is only mentioned by Gordon who indicates that the coldness of sickness occurs in people whose nature tends to coldness, except in very unusual cases[48].

Fevers which have their origin in organic liquids

This deals with the illness of one or more of the four humours which constitute the organs: blood, yellow bile, phlegm and black bile. The humours can alter in both quantity and quality, but generally it is the latter. On occasion we find them referred to by the generic name of putrid fevers[49].

Fever of which the offending materials is the humour, blood

Sinocal fever

Together with the *causon* fever, the tertian and the hectic, the sinoca fever constitutes the quartet of fevers which are described most and, for

[46] al-Isra' ili, p. 43.
[47] Gordon, p. 63.
[48] Gordon, p. 68.
[49] Gordon, for example, indicates it thus: A putrid fever, whose material are the humours, idem.,p. 54.

that reason, we must think that they are considered as the most important by medical practitioners.

Al-Isra'ili maintains that the *sinoca* fever is produced by pure and clean blood inside the vessels of the body, the veins and arteries, without corruption or putrefaction. Also it exists in the heart, in the lung and other large organs[50]. The producing mechanism would be by increasing its usual quantity, the organism does not recognise it and, on arrival at the digestion, the food remains raw, so that it cannot give nutrition to the organs. These putrefy, causing a putrid fever which is called sinoca. But this is contradicted in another part of his treatment when he indicates that the blood is corrupted when it comes out of its natural place, putrefies and changes to many illnesses, among them the *sinoca* fever[51].

However, the same author later indicates that there exists a *sinoca* fever in which the blood does not putrefy. This is called *inflative* fever, because the patient's hands and feet swell up[52]. According to al-Isra'ili , we understand that they are two distinct illnesses, and the term *sinoca* must be used only in the case of the fever in which the humour of blood putrefies.

Avenzoar does not appear to concern himself with *sinoca* fever in spite of its importance, influenced perhaps by the lack of clarity of the concept [53]. Gordon adds equally to our confusion by maintaining that there is a continuous fever from the blood when someone who is very accustomed to exercise stops doing it and, furthermore, eats excessively, particularly if this involves food which engenders a lot of blood or very watery blood, as happens with fruit. According to this author, this fever adopts two forms:

if the quantity of blood increases but is not of bad quality and does not putrefy it is *sinoca* fever,

if blood is engendered in great quantity and, at the same time, is of bad quality and putrefies, then it produces the fever called *sinoco*. The latter has three classes:

Aumastica, in which the temperature always rises, then the dissolution of the offending material is greater than the resolution.

Periaumastica, in which the temperature always goes down, then the resolution overcomes the dissolution.

[50] al-Isra' ili, p. 139.
[51] al-Isra' ili, pp. 212-213.
[52] al-Isra' ili, pp. 214-215.
[53] Avenzoar, p. 395.

Homotena, maintains the same state, so that the dissolution equals the resolution[54].

Galen refers to *acmastica*, *epagmastica* and *homotonos* fevers[55].

We therefore find ourselves in a certain difficulty. On the one hand al-Isra' ili, in one part of the text, says that in the *sinoca* fever the blood does not putrefy and, in another, that it does. For Gordon, there is a fever of the blood without putrefaction, in which only the quantity increases - *sinoca* fever, and another, with putrefaction, which he calls *sinoco*. Because the terminology is confusing, we think that the term *sinocal* is the most adequate to denominate the fever of the blood produced by putrefaction[56].

Furthermore, it draws our attention to the fact that al-Isra' ili does not refer to the triple distinction of fever (which Gordon does recognise), even though Galen used to express it in this way, as we have seen.

2.1.2. Quartan blood fever

The quartan fever by antonomasia derives from black bile. However, according to Gordon, there is a fever which is produced by putrefaction of the blood, and which is easily cured[57]. Neither al-Isra' ili nor Avenzoar speaks of it.

2.1.3. Pleurisy fever

According to al-Isra'ili there is true pleurisy fever and false. In true pleurisy the overheated blood engenders an abscess of the pleura, called pleurisy[58]. In false pleurisy, he tells us, the hot material is outside the instruments of the spirit and does not explain anything further[59]. Avenzoar and Gordon do not mention them, so that we cannot clarify this last concept.

2.1.4. Peripulmonia fever

Al-Isra' ili is clear that this is engendered from the blood which forms an abscess below the diaphragm[60]. It appears in winter and at the end of

[54] Gordon, p. 93-95.
[55] K., VII, p. 337.
[56] Galen uses synochus or synochalis indiscriminately. K., IX, p. 926.
[57] Gordon, p. 111.
[58] al-Isra'ili, p. 139.
[59] al-Isra'ili, pp. 154-155.
[60] al-Isra' ili, pp. 154.

autumn and affects old people in particular and women past their menopause. It is formed below the lung[61]. Avenzoar and Gordon do not mention it.

2.1.5. Fever from pain in the liver

According to al-Isra' ili there is a fever derived from pain in the liver which has blood as material[62]. Avenzoar and Gordon do not mention it.

Fever whose material material is yellow bile

2.2.1. Causon fever

This fever is another of the most amply described, although Galen does not recognise it, at least by this name.

Al-Isra' ili tells us that it is engendered in the interior of the veins and arteries next to the heart and especially in the veins of the mouth of the stomach, liver and lungs. In it the material is inflamed but does not putrefy. It has two forms: one proceeding from the pure red bile, which is called *causon*, which generates a great colour and does not bring with it any humidity, and another which proceeds from the yellow bile, less hot and mixed with some humidity from the phlegm, called *acute* fever[63].

Avenzoar mentions the existence of a yellow bile fever but does not give it the name of *causon*, possibly because Galen does not do so either[64]. According to Gordon, causon is a continuous fever produced by the yellow bile which is found inside the vessels of the main organs (lungs, stomach and liver) and next to the heart, or by salty phlegm. The bile is altered in its quality, quantify or both. Causon is also called *incandescent* fever. According to Avicenna this fever also proceeds from salty phlegm, putrefied and inflamed, but he does not give a name to this form[65].

2.2.2. True frenzy fever

Al-Isra'ili suggests that it is engendered by the boiling of red bile inside the ventricles of the brain or from excessive heat, caused by the mixing of blood and bile in the heart so that the vapours generated, hot and

[61] al-Isra' ili, pp. 156-157.
[62] al-Isra' ili, p.288.
[63] al-Isra' ili, pp. 88-89.
[64] Avenzoar, pp. 397-398.
[65] Gordon, pp. 69-70.

dry, go up to the head and engender a hot abscess in the ventricles of the brain[66]. Avenzoar does not mention it and Gordon speaks of frenzy, not as a class of fever, but as a complication of the *causon* fever[67].

2.2.3. False frenzy fever

This is produced, according to al-Isra'ili, by the vapours which rise to the head owing to illnesses of the stomach or of the uterus, by alterations in the nerves or by putrefaction of the phlegm, which likewise engenders vapours which rise to the head. The same happens if the yellow bile changes into black bile[68]. Neither Avenzoar nor Gordon mention it.

2.2.4. Tertian Fever

This is another of the better studied fevers. It is differentiated from the causon, also produced by a change in the yellow bile, in that in this case the material putrefies.

Al-Isra' ili says that it is produced by the putrefaction of yellow bile of a saffron colour. The humours outside the organism's circulation putrefy, the bile is of a dry nature and because of this putrefies. This fever distresses the patient a lot, because of the acuteness of its material and because it is next to the *causon* fever. If hot food is given to those suffering from tertian fever it can engender frenzy fever[69].

Avenzoar indicates that this fever comes from putrefaction of the yellow bile in the veins or in another part. If it is inside the veins they are the pure, intermittent *tertians*. Also it can proceed from an ephemeral fever[70]. The words of Gordon are that the putrid fever of the yellow bile is known as the *tertian* or *true tertian*. It can be produced from pure yellow bile or from yellow bile mixed with phlegm. In the latter case it is known as *false tertian*. If the bile putrefies inside the veins and the arteries then *continuous fever* is engendered. If it putrefies outside the vessels it is *interpolated fever*[71]. In this case, when the offending material collects together and cannot cool down or be destroyed, the heart heats up excessively, either because the putrid vapour goes to the heart or because one part or another heats up until it arrives from the most deep part of

[66] al-Isra' ili, p. 106.
[67] Gordon, p.75.
[68] al-Isra'ili, p.107.
[69] al-Isra'ili, pp. 232-236.
[70] Avenzoar, p.393.
[71] We respect the denomination of *interpolated*, although possibly would have spoken of *intermittent*. Galen does this. K. XIV, p. 729.

the heart. Or for both reasons. When the heart is heated, together with the rest of the body, it produces a fever[72].

2.2.5. Quartan fever of the yellow bile

In treating the quartan produced by the black bile, Gordon affirms that there is a quartan fever whose origin is the putrefaction of the yellow bile[73]. The other two authors make no reference to this.

2.2.6 Fever from a pain in the side

According to al-Isra'ili, the fever produced by a pain in the side also has as its origin the yellow bile[74]. There is nothing about this from the other two authors.

2.2.7 Semi-cotidian fever

Avenzoar refers to it as being produced by bilious humour the colour of verdigris. He suggests that, on occasions, it also proceeds from an ephemeral fever[75]. Neither al-Isra' ili nor Gordon mention it.

Fevers whose material is phlegm

Daily fever

For al-Isra' ili, the daily fever, or *enfimema,* is produced from the phlegmatic humour. This can putrefy or not. If it putrefies it can be in the whole of the body and engenders an illness called *yposagra.* If it is in the whole of the body it can be inside or outside the vessels. If it is inside it engenders the *daily continuous fever.* If it is outside it produces the *daily temporal fever*[76]. Avenzoar does not mention it. According to Gordon the *daily* is a fever produced by the putrid phlegm. If it is outside the vessels it is *daily interpolated fever*[77].

[72] Gordon, pp. 81-82.
[73] Gordon, p. 111.
[74] al-Isra' ili, p. 288.
[75] Avenzoar, p. 399.
[76] al-Isra' ili, p. 241.
[77] Gordon, p. 115.

2.3.2. Quartan fever of the phlegm

Gordon affirms that there is a Quartan caused by a burning of the phlegm[78]. As in the previous cases of quartan fever of the blood and yellow bile, it is not included by al-Isra' ili or Avenzoar.

2.3.3. Epileos Fever

Al-Isra'ili and Gordon agree that it is produced from thick phlegm the colour of glass; of which one part putrefies inside the vessels and the other part not. The putrefied part engenders fever which heats up parts inside the body, and the part which is not putrefied dissolves and cools down in the parts outside the organism. The only discrepancy is that Gordon calls it *empialos*[79] fever. Galen also differs in that he uses the term *epiala*[80]. Avenzoar does not mention it.

Fevers whose material is black bile

2.4.1. Quartan Fever

Al-Isra'ili asserts that *tetrateo* is a Greek name which means quartan. This fever is born from the humour of black bile and can be putrid or not. If it is not putrid and is spread throughout the body it engenders *icterricia*. If it is not putrid and is just in one organ it produces an abscess called *scliros*. If it is putrid and spread throughout the body, but inside the vessels, it engenders *quartan without trembling*. If it is outside the vessels it produces *quartan with interpolation*, which occurs on one day out of each three[81].

Avenzoar believes that a fever lasting one day can be transformed into quartan fever. It affects middle aged people who eat hard meat, dry cheese, the meat of a camel or an ass, or fish of a large size, or ingest large amounts of rancid meat, olives or aubergines. It affects especially those who have the constitution of black bile, either by nature or by disposition, or from eating inadequate food [82].

Gordon indicates that quartan is a fever produced by the putrefaction of black bile. There is a *continuous quartan* and another *interpolated* . One is *true,* the other *false*. The *true quartan* is engendered from black bile

[78] Gordon, p. 111.
[79] al-Isra' ili, p. 266; Gordon, p.128.
[80] K., VII, p. 751
[81] al-Isra' ili, p. 256.
[82] Avenzoar, p. 396

because the patient has the constitution of black bile, the season is Autumn, and he has eaten food which produces black bile[83].

The most original contribution on this fever is that offered by Avenzoar. He is the only one who affirms that an ephemeral fever can be transformed into a quartan, in patients with a constitution of black bile and after ingesting certain foods rich in black bile.

2.4.2. Fever engendered by pain in the spleen

Al-Isra' ili maintains that there is a fever which is derived from a pain in the spleen and is caused by black bile, of which this organ is its reservoir. It is a weak fever[84]. Neither Avenzoar nor Gordon concern themselves with it.

Fevers which establish themselves in one or more humors

2.5.1. Smallpox

According to al-Isra' ili and Avenzoar, it is the same with smallpox as it is with measles. In this case al-Isra'ili speaks only of smallpox, where it proceeds from the humours of a child which have been in contact with the menstrual blood of the mother during the time that it was in the uterus, although this may be in a very limited quantity. Following intense fatigue, pain or fever, the softest part of the humour produces measles and the thick part of the humour produces smallpox,

According to al-Isra' ili, pure blood, yellow bile, phlegm or black bile can equally be the cause. Those of black bile can engender *syncope*. These illnesses never appear in old people because the offending material does not last into old age. It is related to a change in the weather, age, food or constitution. Those who suffer most are gluttonous children who eat inordinate amounts of food and do not take precautions against draughts and other accidents. Then their hot and wet constitution makes them more prone to putrefaction[85].

To this Gordon adds that smallpox is engendered from the blood and measles from the black bile. It is a purgative common to all, but more common in those patients conceived at the time of menstruation. It appears also to be caused by a bad diet, especially with foods which break

[83] Gordon, p. 102.
[84] al-Isra' ili, p. 288.
[85] al-Isra'ili, pp. 219-221;Avenzoar, p. 433.

up easily such as milk and fish eaten together at the same meal. Above all if they are hot and wet. Also in those patients who do not use preventative blood-letting, and during severely adverse conditions when there are epidemics of the blood. Likewise in those who have a poor sanguine crasis[86].

2.6. Fevers from a mix of blood and yellow bile

2.6.1. Icterus Fever

Al-Isra' ili tells us of icterus fever, of which he does not give more detail, save that it comes from a mix of blood and yellow bile[87]. Avenzoar and Gordon do not concern themselves with it.

2.6.2. Causonides fevers

They are only described by Gordon. They are formed of blood and yellow bile which putrefy inside the vessels. If the mix is half and half it is called *causon sinocos*; if the yellow bile predominates over the blood it is called *causon sinóquides* and if the blood predominates over the yellow bile, *sinocus causonides*[88].

Fevers from a mix of yellow bile and phlegm

2.7.1. Emitreo Fever

Al-Isra' ili maintains that the *emitreo* fever comes half from material from the yellow bile which is outside the vessels and half from material from the phlegm which is inside the vessels. The material from yellow bile is the colour of egg yolk[89]. Avenzoar does not mention it. Nor does Gordon.

2.7.2. Liparios Fever

Al-Isra' ili says that it is born of the mix of burning yellow bile and glassy bile. The external parts of the patient are hot and those inside

[86] Gordon, pp. 150-151.
[87] al-Isra'ili, p. 182
[88] Gordon, p.129.
[89] al-Isra'ili, pp. 253 and 232-236.

are cold[90]. Avenzoar does not mention it and Gordon indicates only that it behaves in exactly the opposite way form the *empialos* fever. It is called *liparia*[91].

2.8 Fevers from a mix of phlegm and black bile

2.8.1. Six Day and Seven Day Fevers

Neither al-Isra' ili nor Avenzoar mention it. Gordon affirms that the sixth day and seventh day fevers are composed of phlegm and black bile. They attack the patient every six days or every seven days[92].

2.9 Fevers from a mix of various indeterminate humours

2.9.1. Composite Fevers

Only Avenzoar speaks of these, who says that there are fevers in which the offending materials are various humours which are mixed, for which the signs depend on those which have entered in the mixture[93]. There is a fever of yellow bile and blood, fever of yellow bile and black bile, of yellow bile and phlegm etc.[94].

2.9.2. Erratic Fever

This is quoted only by Gordon, in spite of the fact that Galen mentions it[95]. The erratic fever is produced by many humours putrefying and burning in various places. When they come together then they generate quartan fever[96].

2.9.3. Emitriteo Fevers

Emitriteo fevers are quoted only by Gordon. Galen himself refers to *hemitritaios fevers*,[97] so it puzzles us that neither al-Isra' ili nor Avenzoar

[90] al-Isra' ili, p. 269
[91] Gordon, p.128.
[92] Gordon, p. 127.
[93] Avenzoar, p. 400.
[94] Avenzoar, p. 406.
[95] K., IX, p. 680.
[96] Gordon, p. 128.
[97] K., VII, p. 358.

mention them. The *emitriteo* fevers are composed of one continuous fever and another interpolated, to produce *daily continuous* and *interpolated tertian, continuous tertian* and *daily interpolated, continuous quartan* and *interpolated tertian* [98].

Fevers which are based in the solid material of the organs

Hectic Fever or Consumption

It is another of the better described fevers. There are various classes of consumption:

Natural consumption or without fever. This occurs with greater frequency in old people, rarely in young people and mature adults. It is called *old-age hectic* or decrepitude. The cold and dry temperament of old people favours the gradual loss of humidity and heat which is the cause of consumption. Also it occurs in people of that age since their natural power to break down food and attract nourishment to the organs is extremely weak. This means that they cannot retain the moisture of the food in their body, which escapes through vapour and sweat.

This form of consumption is studied in more or less detail by al-Isra'ili and Gordon. However, Avenzoar does not occupy himself with it completely.

Non-natural consumption, of which al-Isra' ili recognises four classes and Gordon only two. According to the latter, there are only two classes of consumption, one without fever, which is that which we have just seen, and one with fever.

These would be the possibilities of non-natural consumption, according to al-Isra'i li[99]:

Cold consumption without fever, which affects the body through a few existing cold abscesses or some prolonged illnesses which consume the essential moisture of the body. The coldness diminishes the digestive power over food which remains raw, so that the organs do not receive the nourishment from it.

Hot consumption but without fever. The consumption is produced by an excess of heat in the blood, which changes the constitution of the heart. The altered heart corrupts the blood which loses its habitual flavour, so that the organs do not recognise it, do not take the necessary nourishment, and consumption results.

[98] Gordon, p.129.
[99] al-Isra' ili, pp. 58-62.

Consumption with fever, properly hectic fever, also known as *etiupsi, phtisic* or *consumptive* fever. It is the only one which Gordon and Avenzoar mention of the three types indicated[100]. It has three stages; on this our three authors agree, although not exactly on its content.

Within hectic fever al-Isra' ili distinguishes in its turn:

Simple hectic fever, not associated with any other fever. Hectic fever is like consumption of the essential moisture of the organs. It is a fever which does not work, therefore, on the humours, liquids, as happens with the putrid ones, nor on the spirits like the ephemerals, but on the solid parts of the body.

Compound hectic fever, in that mixed with it is another fever, complicating the process. Two reasons for the fact that another fever can appear associated with it: the diseases of the soul - anger, sadness, grief, insomnia etc.; and diseases of the body, when the body does not find itself clean of the humours which are predisposed to putrefy. We understand that in the first case it would always be a question of ephemeral fevers, or those of one day, which are those which establish themselves on the psychic spirit. In the second case, putrid fevers which establish themselves on any of the humours, blood, yellow bile, phlegm or black bile[101].

Avenzoar and Gordon without speaking of a simple hectic, nor either of the two possible causes, do admit that such an association of fevers can exist.

Hectic fever which does not come from another illness

Hectic fever which does come from another illness. This illness precedes it, so that if not correctly cured, it degenerates into hectic fever.

These two last forms are also recognised by Avenzoar and Gordon.

3.2 Epidemic fevers

Plagues appear through the change and corruption of the air during the four seasons of the year. According to Avenzoar the worst air is that which contains heat and moisture, because they cause the humours to putrefy. Especially when the air stagnates and the dryness does not move. When the cause is contaminated air, contaminated water or food

[100] Gordon, p. 130.
[101] al-Isra' ili, p.73.

in a poor state then there is no crisis, as there is with other fevers[102]. Gordon adds to all this that epidemic fevers appear in corrupt, sterile times when the fields, air and water deteriorate, and that all are difficult to cure since they cause fundamental damage to the principal members[103].

They are caused, according to al-Isra' ili, by smoke, dust from the ground, vapour from the sea, stagnant lakes or waters and the stench of dead things. These illnesses do not arise from inequality of the humours but from the destruction of the substance of the patient. They are, therefore, a consequence of the putrefaction of the organs of the body[104].

Epidemics also appear in cases of starvation, according to Avenzoar, so that people feel obliged to eat seeds which are in poor condition or are on the point of being so. Also from eating noxious herbs such as euphorbium[105], bitter vetch [106], or serpentarium root[107]. Or from eating meat which is bad because of its dryness or acidity, as happens in the case of the fat from bone marrow[108].

Al-Isra' ili portrays the mechanism of action as coming about through the obstruction and closing of the pores. This takes place for two reasons: one exterior, by means of cold air, baths which are very dry or contain sulphurous or muddy water. The other interior, through humours which swell through lack of exercise, viscous food taken in great quantity or in the wrong order. Another cause is to bathe without having digested food in the stomach, because the heat of the bath draws the moisture from the food from the inside to the outside and, by leaving it crude, it cannot get out and allow the pores to close and tighten. It also takes place when the patients eat more than they can support. When this happens the vapours concentrate and the remains of the digestion is left inside the body and is not expelled[109].

Avenzoar for his part, indicates another mechanism. The noxious waters produce an obstruction of the liver, weaken the spleen and kidneys. They produce stones in the kidneys or in the gall-bladder. The harm caused by contaminated air is not as bad as that produced by contaminated water, except in the case of sudden death. It arrives at the heart by means of respiration and produces a corruption of its constitution,

[102] Avenzoar, pp. 424-431.
[103] Gordon, pp. 137-139.
[104] al-Isra' ili, p. 216.
[105] Euphorbium is, according to Laguna, hot and dry in the fourth grade, therefore a poison. PEDAZIO DIOSCORIDES, *op. cit.* p. 348.
[106] Toasted flour of the bitter vetch is, however, considered by Dioscórides as useful for those who do not thrive on food. PEDAZIO DIOSCORIDES, *op. cit.* p. 194.
[107] The ingestion of serpentarium root also does not pose problems, according to Dioscórides, PEDAZIO DIOSCORIDES, *op. cit.* p. 243, sv. *Dragontea mayor.*
[108] Avenzoar, pp. 424-431.
[109] al-Isra' ili, pp. 205-206.

according to its state or age of the patient. If this happens to a person then they die because the heart is an important organ. For its part, contaminated air produces a separation of the vertebrae of the neck, so that an angina of the neck appears and there is no means of getting rid of it. This separation occurs because the moisture is stagnant and separates the vertebrae, squeezing the larynx.

Gordon explains for his part that air and water are simple bodies and therefore not corrupt, but it is possible that corrupt vapours can be mixed with them. Once putrefied they corrupt animals and humans because putrid air goes to the heart and the whole body. And, according to the diversity of the corruption, fevers of the blood, bile etc. are engendered, depending on the constitution of the individuals[110]. On this last point he differs from al-Isra'ili and Avenzoar who maintain that fevers affect solid bodies, not the humours.

3.3 Fevers which come from a disease of the brain

Al-Isra' ili maintains that in the fever which comes from a disease of the brain its acuteness is explained by the nerves and the brain. At the cessation of the disease, the fever ceases also[111]. Neither Avenzoar nor Gordon mentions it.

Commentary

We have tried, as far as possible, to establish a terminology of medieval fevers, which we show here in alphabetic order. In total we have identified fifty-four different fevers, sometimes known by various different names, in which case we have made reference to the most well known.

Although it is not the object of this work, we acknowledge that some matters remain outstanding. Many of the recognised fevers are not covered by all three authors. To be precise - of the fifty-four, thirty-three are mentioned by al-Isra'ili, seventeen by Avenzoar and twenty-six by Gordon. But there are more. We find fevers described by medieval authors which do not appear in the texts of Galen, the great mentor of medieval medicine. The opposite also occurs to an even greater extent, when many fevers referred to by Galen are not recognised by our authors. All this will be included in a more extensive study on medieval fevers which we have already begun.

[110] Gordon, pp. 137-139.
[111] al-Isra' ili, p. 288.